

Original Research Article

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## Impact of Different Pre Sowing Treatments with Organics and Botanicals on Growth Yield and Yield Attributing Traits of Sweet Corn

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### ABSTRACT

#### Keywords

Sweet corn, pre sowing treatments, Panchagavya, Moringa leaf extract

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Seeds treated with chemicals are usually toxic to humans and animals. So as an alternative approach, a field experiment was carried out during *Kharif* season of 2021 to study the impact of different pre sowing treatments with organics and botanicals on growth, yield and yield attributing traits of Sweet corn (*Zea mays* L.). Experiment was subjected to 13 pre sowing treatments each replicated thrice. Seed treatment with T3 Panchagavya at 7% for 12 hours was most effective in improving growth and yield parameters viz., Field emergence percentage (92.22%), Plant height (209.13cm), days to maturity (76.33), Cob length (18.36cm), Seed index (25.8g), Seed yield per plant (330.05g), Seed yield per plot (5.51t/ha), Biological yield (15.27t/ha) and Harvest index (35.83%). This study revealed that pre sowing treatments with organics and botanicals can be significantly effective in enhancing the growth and yield parameters of Sweet corn and they are of low cost, eco-friendly and toxic free.

### Introduction

Maize (*Zea mays* L.) belongs to family Poaceae with (2n=20) as chromosome number. It is a third leading crop of the world after rice and wheat (Sandhu *et al.*, 2007). It is a C4 plant with high yielding potential and is being grown throughout the year but mainly as *Kharif* crop. In India maize is grown in 9.86 Million hectare area with a production and productivity of 31.51 million tones and 3,195 kg/h respectively contributing 2.53% share over world's

production (Directorate of Economics and Statistics 2021). There is a strong possibility of developing better and industrially important hybrids than high yielding potential and nutrition in relation to high yield, high starch, protein and oil content (Gautam *et al.*, 2003). Among various specialty corns, Sweet corn (*Zea mays* L. var. *saccharata*) is a new choice of the progressive farmers as its green cobs as well as nutritious green fodder fetch higher market prices (Painyuli *et al.*, 2013). Nutritional value per 100g. of sweet corn is Energy 360KJ, Carbohydrates 19.02g,

Sugars 3.22g, Dietary fibres 2.7g, Fat 1.18g, Protein 3.2g, Vitamins, Minerals and Water in trace quantities (Source: USDA Food Data Central).

Pre-sowing treatments is for ensuring their earlier, successful germination. This will help people to minimize their production cost of seedlings on a broad scale. A considerable body of evidences suggests that pre-sowing treatments strongly enhance the germination process Hossain *et al.*, (2005). Seed treatments increased the grain yield, biological yield and harvesting index over unprimed seeds Mehboob *et al.*, (2015). Organic agriculture is now finding place in the mainstream of development and shows great promise commercially, socially and environmentally.

While there is continuum of thought from earlier days to the present, the modern organic movement is radically different from its original form. Liquid formulations that are used in organic agriculture like Panchagavya, Beejamrutha and Jeevamrutha are the fermented products which are used as plant growth enhancing substances prepared with material available with farmers. They are the rich sources of beneficial micro flora which support, stimulate the plant growth and help in getting better vegetative growth and also good quality yield.

Physio-chemical properties of Panchagavya revealed that they possess almost all the major nutrients, micro nutrients and growth hormones (IAA & GA) required for crop growth. Predominance of fermentative microorganisms like yeast and lactobacillus might be due to the combined effect of low pH, milk products and addition of jaggery/sugarcane juice as substrate for their growth. Panchagavya spray and Panchagavya seed treatment showed higher rhizosphere microbial population followed by beejamrutha seed treatment Mujeera Fathima *et al.*, (2014). Sreenivasa *et al.*, (2010) have reported the presence of many beneficial microorganisms viz., nitrogen fixers, phosphorus solubilizers, actinomycetes and fungi in Jeevamrutha and Beejamrutha. The organic liquid formulation, jeevamrutha also comes in one of the

low cost formulations, which are responsible for the enrichment of soil with indigenous micro organisms required for better mineralization of soil and it helps in enhancement of growth of plants (Gore and Sreenivasa, 2011).

An alternative approach of chemical treatments is to mix the seed before storage with natural extracts such as neem or moringa leaves. The advantage is that the treatment is not toxic and very cheap, and the seed may be used as food for humans or animals (Kelly, 1988).

Pre sowing treatment with Moringa leaf extract has been reported to effectively improve germination and seedling growth (Phiri *et al.*, 2010); due to the presence of zeatin that plays an important role in cell division, cell elongation, promotes the crop growth and helps to withstand adverse climatic conditions.

Based on the content of active ingredient, neem seeds and leaves contained azadirachtins the main active compound, meliantriol, salanin, and Nimbin, which are the result of secondary metabolites from the neem tree, which are concentrated more in the seed and the bark; responsible for its extensive usage on plants because of its beneficial effects (Mujeera Fathima *et al.*, 2014).

## **Materials and Methods**

The experimental study was carried out during *Kharif* Season 2021 at Field Experimentation Center of Department of Genetics and Plant Breeding, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, U.P.

The Experimental site is located at, 25.87039° 42'' N latitude, 81°06'7''56'' E longitude and 98 m altitude above the mean sea level (MSL). The sandy loam texture of soil was observed with moderate water holding capacity having pH varies from 7.0 to 8.0. The experiment was laid out in Randomized Block Design with 13 treatments, in three replications. With the view to find out suitable pre sowing

treatments with organics and botanicals on Sweet corn (SUGAR-75).

The experiment comprising 13 possible treatments viz., T0 control, T1 Panchagavya @ 3% for 12 h, T2 Panchagavya @ 5% for 12 h, T3 Panchagavya @ 7% for 12 h, T4 Jeevamrutha @ 3% for 12 h, T5 Jeevamrutha @ 5% for 12 h, T6 Jeevamrutha @ 7% for 12 h, T7 Moringa leaf extract @ 3% for 12 h, T8 Moringa leaf extract @ 5% for 12 h, T9 Moringa leaf extract @ 3% for 12 h, T10 Neem leaf extract @ 3% for 12 h, T11 Neem leaf extract @ 5% for 12 h, T12 Neem leaf extract @ 7% for 12 h.

After preparation of the above said treatments, the prepared liquid formulations were diluted to 3%, 5%, 7% concentrated solutions and applied as seed treatments. Sweet corn seeds were soaked in necessary medium for 12 hrs. Untreated seeds were formed as the control.

After 12 hours of soaking the medium was drained away from the seeds and the seeds were air dried to attain its weight. After seed treatments, seeds were sown in field for taking field observations viz., Field emergence percentage at 7 DAS, Plant height at 30, 45, 60 DAS and at harvest DAS (cm), Days to 50% Tasselling, Days to 50% Silking, Days to Maturity, Cob length (cm), Cob girth (cm), Number of cobs plant, Number of rows per cob, Number of grains per row, Seed index (g), Seed yield per plant (g), Seed yield per plot (t ha<sup>-1</sup>), Stover yield (t ha<sup>-1</sup>), Biological yield (t ha<sup>-1</sup>) and harvest index (%). Analysis was done by one-way ANOVA carried out according to procedure of Randomized Block Design (Fisher, 1936).

## Results and Discussion

As the study was conducted to determine the impact of different doses of pre sowing treatments in Sweet corn, the results obtained were found effective in increasing the growth and yield attributes significantly as compared to control. The results in Table 1, 2 depicts that the mean performance of different doses of pre sowing treatments with

organics and botanicals on growth, yield and yield attributing traits of Sweet corn (*Zea mays* L.).

## Growth Attributes

From the data represented in Table. 1 Growth attributes are summarized statistically.

The maximum field emergence percentage was registered with T3 – Panchagavya @ 7% (92.22) followed by T2 – Panchagavya @ 5% (91.11) which was equivalent to T9 – Moringa leaf extract @ 7% statistically, whereas minimum field emergence at 10 DAS was registered in T0 control (74.44).

Similar findings by Patil *et al.*, (2021) determined that, Sorghum seedlings are subjected to four halo priming treatments with NaCl and four panchagavya treatments. Panchagavya 8 percent has the best outcome, followed by Panchagavya 6 percent. All priming treatments were shown to be different from the control.

The maximum plant height at 30 Days after sowing was registered in T3 – Panchagavya @ 7% (54.83) followed by T2 – Panchagavya @ 5% (53.8) which was equivalent to T9 – Moringa leaf extract @ 7% statistically, whereas minimum plant height at 30 Days after sowing was registered in T0 control (47).

The maximum plant height at 45 Days after sowing was registered in T3 – Panchagavya @ 7% (108.3) followed by T2 – Panchagavya @ 5% (106.5) which was equivalent to T9 – Moringa leaf extract @ 7% statistically, whereas minimum plant height at 45 Days after sowing was registered in T0 control (96.93).

The maximum plant height at 60 Days after sowing was registered in T3 – Panchagavya @ 7% (156.67) followed by T2 – Panchagavya @ 5% (154.43) which was equivalent to T9 – Moringa leaf extract @ 7% statistically, whereas minimum plant height at 60 Days after sowing was registered in T0 control (141.7).

The maximum plant height at harvest days after sowing was registered in T<sub>3</sub> – Panchagavya @ 7% (209.13) followed by T<sub>2</sub> – Panchagavya @ 5% (206.67) which was equivalent to T<sub>9</sub> – Moringa leaf extract @ 7% statistically, whereas minimum plant height at harvest days after sowing was registered in T<sub>0</sub> control (171.86). Similar findings by Rex Immanuel *et al.*, (2021) reported that the factors like agronomic efficiency, apparent nutrient recovery along with value cost ratio was high in application of 3% Panchagavya. The early days to 50% tasselling was registered in T<sub>3</sub> – Panchagavya @ 7% (54.66) followed by T<sub>2</sub> – Panchagavya @ 5% (55.33) which was equivalent to T<sub>9</sub> – Moringa leaf extract @ 7% statistically, whereas late days to 50% tasselling was registered in T<sub>0</sub> control (61.33).

The early days to 50% silking was registered in T<sub>3</sub> – Panchagavya @ 7% (61.33) followed by T<sub>2</sub> – Panchagavya @ 5% (61.67) which was equivalent to T<sub>9</sub> – Moringa leaf extract @ 7% statistically, whereas late days to 50% silking was registered in T<sub>0</sub> control (66.67).

The early days to maturity was registered in T<sub>3</sub> – Panchagavya @ 7% (76.33) followed by T<sub>2</sub> – Panchagavya @ 5% (76.67) which was equivalent to T<sub>9</sub> – Moringa leaf extract @ 7% statistically, whereas late days to maturity was registered in T<sub>0</sub> control (84.67).

### **Yield Attributes**

From the data represented in Table. 2, Yield attributes are summarized statistically.

The longest Cob length was registered in T<sub>3</sub> – Panchagavya @ 7% (18.36) followed by T<sub>2</sub> – Panchagavya @ 5% (17.63) which was equivalent to T<sub>9</sub> – Moringa leaf extract @ 7% statistically, whereas minimum Cob length was registered in T<sub>0</sub> control (14.23). The highest Cob girth was registered in T<sub>3</sub> – Panchagavya @ 7% (14.67) followed by T<sub>2</sub> – Panchagavya @ 5% (14.50) which was equivalent to T<sub>9</sub> – Moringa leaf extract @ 7% statistically, whereas minimum Cob girth was

registered in T<sub>0</sub> control (11.03). More Number of Cobs per plant was registered in T<sub>3</sub> – Panchagavya @ 7% (2.13) followed by T<sub>2</sub> – Panchagavya @ 5% (1.93) which was equivalent to T<sub>9</sub> – Moringa leaf extract @ 7% statistically, whereas lesser Number of cobs per plant was registered in T<sub>0</sub> control (1.13).

The highest Number of rows per cob was registered in T<sub>3</sub> – Panchagavya @ 7% (17.40) followed by T<sub>2</sub> – Panchagavya @ 5% (17.13) which was equivalent to T<sub>9</sub> – Moringa leaf extract @ 7% statistically, whereas minimum Number of rows per cob was recorded in T<sub>0</sub> control (13.40).

The maximum Number of grains per row was registered in T<sub>3</sub> – Panchagavya @ 7% (34.46) followed by T<sub>2</sub> – Panchagavya @ 5% (33.93) which was equivalent to T<sub>9</sub> – Moringa leaf extract @ 7% whereas minimum Number of grains per row was recorded in T<sub>0</sub> control (31.20). Similar findings by Stalin *et al.*, (2019) reported that the application of 3% Panchagavya in maize showed higher number of cobs per plant 2.64 longest cob length 22.43.

The maximum Seed Index was registered in T<sub>3</sub> – Panchagavya @ 7% (25.8) followed by T<sub>2</sub> – Panchagavya @ 5% (25.77) which was equivalent to T<sub>9</sub> – Moringa leaf extract @ 7% statistically, whereas minimum seed index was registered in T<sub>0</sub> control (25.13).

The highest Seed yield per plant was registered in T<sub>3</sub> – Panchagavya @ 7% (330.05) followed by T<sub>2</sub> – Panchagavya @ 5% (290.11) which was equivalent to T<sub>9</sub> – Moringa leaf extract @ 7% statistically, whereas minimum Seed yield per plant was registered in T<sub>0</sub> control (118.77).

Similar findings by Subha *et al.*, (2014) found that the highest seed yield was obtained with the seed treatment with Panchagavya. The highest Seed yield per plot was registered in T<sub>3</sub> – Panchagavya @ 7% (5.51) followed by T<sub>2</sub> – Panchagavya @ 5% (5.26) which was equivalent to T<sub>9</sub> – Moringa leaf extract @ 7% statistically, whereas minimum Seed yield per plot was registered in T<sub>0</sub> control (1.73).

**Table.1** Mean performance of different pre sowing treatments for pre harvest characters in Sweet corn (*Zea mays* L.)

Treatments	Field Emergence (%)			Plant height (cm)				Days to 50% Tasselling	Days to 50% Silking	Days to Maturity
	4 DAS	7 DAS	10 DAS	30 DAS	45 DAS	60 DAS	At harvest			
<b>T<sub>0</sub></b>	36.67	60	74.44	47	96.93	141.7	171.86	61.33	66.67	84.67
<b>T<sub>1</sub></b>	50	70	90	52.03	104.6	153.2	202.16	56.33	62.33	77.67
<b>T<sub>2</sub></b>	51.11	71.11	91.11	53.8	106.5	154.43	206.67	55.33	61.67	76.67
<b>T<sub>3</sub></b>	52.22	71.11	92.22	54.83	108.3	156.67	209.13	54.66	61.33	76.33
<b>T<sub>4</sub></b>	43.33	64.44	82.22	49.4	101	147.26	185.76	59.66	65	83
<b>T<sub>5</sub></b>	44.44	65.55	83.33	60.67	102	148.6	192.6	58.66	64.67	81.67
<b>T<sub>6</sub></b>	45.56	66.67	84.44	51.26	102.2	149.56	193.63	57.66	63.33	80.67
<b>T<sub>7</sub></b>	46.67	67.78	86.66	51.9	103	150.56	197.9	56.66	62.33	78.67
<b>T<sub>8</sub></b>	47.78	68.88	88.88	52.73	103.6	151.93	202.06	55.66	62	77.67
<b>T<sub>9</sub></b>	48.89	71.11	91.11	53.8	105.5	152.86	203.93	55.33	61.67	76.67
<b>T<sub>10</sub></b>	40	61.11	76.67	47.26	98.06	142.23	175.13	61	65.67	84
<b>T<sub>11</sub></b>	41.11	62.22	77.78	48.73	98.73	143.16	180.67	60.33	65.67	83
<b>T<sub>12</sub></b>	42.22	63.33	81.11	49.26	100	144.3	185.83	60	65.33	81.67
<b>Minimum</b>	36.67	60	74.44	47	96.93	141.7	171.87	54.66	61.33	76.33
<b>Maximum</b>	52.22	71.11	92.222	54.83	108.3	156.7	209.13	61.33	66.67	84.67
<b>Mean</b>	45.38	66.41	84.61	50.97	102.3	148.96	192.87	57.89	63.66	80.17
<b>CV</b>	3.65	2.2	1.99	2.11	1.44	7.5	2.35	1.59	1.43	2.07
<b>S.Em</b>	0.95	0.84	0.97	0.62	0.85	6.45	2.62	0.53	0.52	0.96
<b>CD 5%</b>	2.79	2.46	2.84	1.81	2.49	18.83	7.65	1.55	1.54	2.82
<b>F Test</b>	S	S	S	S	S	S	S	S	S	S

**Table.2** Mean performance of different pre sowing treatments for post harvest characters in Sweet corn (*Zea mays* L.)

Treatments	Cob Length (cm)	Cob girth (cm)	No. of cobs per plant	No. of rows per cob	No. of grains per row	Seed index (g)	Seed yield per plant (g)	Seed yield per plot (t ha <sup>-1</sup> )	Stover yield (t ha <sup>-1</sup> )	Biological yield (t ha <sup>-1</sup> )	Harvest index (%)
T <sub>0</sub>	14.23	11.03	1.13	13.40	31.20	25.13	118.77	2.23	5.23	7.46	29.82
T <sub>1</sub>	17.33	13.60	1.60	16.40	33.53	25.66	226.94	4.9	9.2	14.1	34.83
T <sub>2</sub>	17.63	14.50	1.93	17.13	33.93	25.77	290.11	5.26	9.56	14.83	35.49
T <sub>3</sub>	18.36	14.67	2.13	17.40	34.46	25.8	330.05	5.51	9.76	15.27	35.83
T <sub>4</sub>	15.26	12.33	1.53	15.06	31.73	25.26	185.7	3.5	7.16	10.66	32.79
T <sub>5</sub>	15.9	12.33	1.67	15.26	31.80	25.3	204.82	3.56	7.2	10.76	33.14
T <sub>6</sub>	16.13	12.56	1.73	15.26	32.13	25.33	215.14	3.93	7.83	11.77	33.41
T <sub>7</sub>	16.3	13.33	1.80	16.13	32.20	25.36	236.61	4.1	8.06	12.16	33.68
T <sub>8</sub>	16.66	13.53	1.86	16.60	32.86	25.43	258.92	4.33	8.33	12.66	34.2
T <sub>9</sub>	17.63	14.23	1.86	17.13	33.46	25.5	273.61	4.6	8.6	13.2	34.84
T <sub>10</sub>	14.46	11.50	1.33	13.80	31.26	25.16	145.06	2.7	5.93	8.63	31.25
T <sub>11</sub>	14.76	11.63	1.46	14.33	31.53	25.23	167.9	3.1	6.53	9.63	32.16
T <sub>12</sub>	14.86	11.83	1.53	15.00	31.60	25.26	183.63	3.23	6.7	9.93	32.53
<b>Minimum</b>	14.23	11.03	1.13	13.4	31.2	25.13	118.77	2.23	5.23	7.46	29.82
<b>Maximum</b>	18.36	13.6	2.13	17.4	34.47	25.8	330.05	5.51	9.76	15.27	35.83
<b>Mean</b>	16.12	12.85	1.66	15.61	32.44	25.4	218.25	3.92	7.7	11.62	33.38
<b>C.V.</b>	3.96	5.17	11.38	4.63	1.83	0.24	13.63	9.31	8.58	8.74	2.63
<b>S.E.</b>	0.36	0.38	0.109	0.41	0.34	0.036	17.18	0.21	0.38	0.58	0.507
<b>C.D. 5%</b>	1.07	1.12	0.31	1.21	1.0023	0.106	50.15	0.61	1.11	1.71	1.48
<b>F Test</b>	S	S	S	S	S	S	S	S	S	S	S

The highest Stover yield per plot was registered in T<sub>3</sub> – Panchagavya @ 7% (9.76) followed by T<sub>2</sub> – Panchagavya @ 5% (9.56) which was equivalent to T<sub>9</sub> – Moringa leaf extract @ 7% statistically, whereas minimum Stover yield was registered in T<sub>0</sub> control (9.2). The highest Biological yield per plot was registered in T<sub>3</sub> – Panchagavya @ 7% (15.27) followed by T<sub>2</sub> – Panchagavya @ 5% (14.83) which was equivalent to T<sub>9</sub> – Moringa leaf extract @ 7% statistically, whereas minimum Biological yield was registered in T<sub>0</sub> control (7.46).

The highest Harvest index was registered in T<sub>3</sub> – Panchagavya @ 7% (35.83) followed by T<sub>2</sub> – Panchagavya @ 5% (35.49) which was equivalent to T<sub>9</sub> – Moringa leaf extract @ 7% statistically, whereas minimum Harvest index was registered in T<sub>0</sub> control (29.82).

The present study concluded that all the pre sowing treatments showed significantly beneficial impact than control. Seed treatment with T<sub>3</sub>-Panchagavya @ 7% for 12 hours has shown significantly better performance followed by Panchagavya @ 5% for 12 hours in all the growth, yield and yield attributing traits. So, organics and botanicals are eco friendly, cost effective with high yielding capacities. Further investigation is required to improve the techniques used in this experiment so that it can be utilized commercially.

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